

TRAINING OF TRANSLATORS AND IMPLEMENTATION OF AI IN THE EDUCATIONAL PROCESS: CHALLENGES AND PROSPECTS

S. Yukhymets¹, O. Koliasha²

^{1,2}Odessa National Maritime University, Ukraine

Mechnikova str., 24, Odessa, 65029

²Drohobych Ivan Franko State Pedagogical University, Ukraine

I. Franko str., 24, Drohobych, Lviv region, 82100

²olenakoliasha@gmail.com

¹yukhymets.svetlana@gmail.com

¹<https://orcid.org/0000-0003-3350-7310>

²<https://orcid.org/0000-0001-5301-480X>

Abstract. The view of the science of translation as an applied branch of linguistics, which developed in the middle of the last century at the stage of formation of this scientific discipline, does not correspond to the current state of scientific knowledge of translation, which can only be transdisciplinary. Given that currently, the training of translation personnel is carried out mainly by teachers of foreign languages who do not have the necessary understanding of translation activity and the differences between linguistic didactics and translation didactics, it is also important to develop professional retraining programs in educational institutions with a pedagogical or philological focus. Thus, today the professional training of a translator, which already competes, so far successfully, with AI, poses many pressing questions to the scientific and pedagogical community, the solution of which cannot be delayed: how many translators will be needed in the digital space; with what competencies and cognitive abilities; For which fields of activity and with which language combinations; what will be the nature of human interaction with artificial intelligence; will the translation remain as we are used to imagine it today. All these and many other questions of a futuristic plan are necessarily faced by those who are entrusted by society to prepare translators for the digital age because those who come to master the speciality of translator today will enter the labour market only in 4-6 years when AI reaches such a level of abilities, which is difficult to predict today.

Keywords: translation, digital age, artificial intelligence, neural machine translation.

Translation is never just about languages, it is also influenced by culture. Compared to machine translation, human translation is more unique and cultural because translations also reflect a way of understanding and interpretation. In other words, human intelligence will make it possible to translate them into living human experiences and contribute to a better understanding by the target audience. Today, a new concept is born — "digital translation", which defines a new type of translation technology, a system of interaction between a translator and digital information and communication tools, artificial intelligence (AI), designed to increase the efficiency of translation art and the quality of translation products. In this regard, three types of approaches are considered: cognitive-technological — correlation of translation technologies and digital information and communication technologies in the modern world; socio-economic — possible social changes that may affect the translation profession in the next 20 years; Pedagogical —

features of training translation staff for the successful functioning of the "digital society".

Throughout its history, translation has often been defined as an art. French encyclopedist scientist D'Alembert in the middle of the 18th century in his "Observations on the Art of Translation" wrote about translation as an art that should not be required to obey rules and laws too rigidly, because this could equate the translator to a king captured by slaves (d'Alembert, 1822). Art, as is known, is an activity based on the figurative understanding of reality; it is also a form of creativity, directed in such a way as to reflect what is interesting not only to the creator himself but also to other people; finally, it is one of the ways of knowing the world. The word art has Slavic roots in both Church Slavonic and Old Slavic languages - it is "experience, test".

The art of speech transformation, the art of mediation, the art of decision-making in an environment of uncertainty, translation is the work of the intellect, which involves not only

linguistic knowledge, a broad outlook, and technological mastery, but also creativity, even cunning, dexterity and intelligence, as well as the ability to social and psychological adaptability.

These and many other qualities form the cognitive portrait of a person who devotes his life to translation - a type of verbal art - regardless of the historical era, for what purpose, and in which language pair it is carried out.

The 20th century turned translation into a mass profession, and the art of translation could not be passed on from master to master: a scientific understanding of the phenomenon of translation was needed. At the dawn of modern scientific knowledge of translation, two hundred years after D'Alembert's observations on the Art of Translation, the French linguist Munin (1963) stated that translation remains an art, but like medicine, an art based on science.

Modern technological transformations caused by the transition of society to the "digital" era are revolutionary and affect all aspects of social life - from the development of social institutions to the organization of everyday life and socialization of the individual, and therefore the problem of digitalization today attracts special attention of science and society (Koliasa et al., 2021).

The onset of a new industrial revolution was announced by Klaus Schwab, the initiator, ideological inspirer and permanent president of the Economic Forum. known for his economic predictions that often come true: "We are standing at the beginning of a revolution that will fundamentally change our lives, our work and our communication. In terms of scale, volume and complexity, this phenomenon, which I consider the fourth industrial revolution, has no analogues in all previous human experience" (Schwab, 2016: 8).

2002 is considered the beginning of digitization. At the same time, many questions arise, the main of which is how to make a digital transition with all the consequences for security, sovereignty and quality of life, what the result of this transition can be, what society will emerge as a result of all these changes, and whether humanity will change.

The assessment of the prospects of digital transformation thus turns out to be one of the key tasks along with the implementation of the digital transition strategy itself. In these conditions, one cannot help but think about the future of the art of translation.

Indeed, the history of translation convincingly shows that the evolution of this type of cognitive-communicative activity is directly related to the development of technologies that ensure perception, fixation, storage, reproduction and transmission of information. The invention of technical means for receiving and transmitting sound at a distance led to the birth of simultaneous interpretation. The development of algorithms for automatic interlanguage transitions initiated the so-called machine translation.

Over the centuries, information carriers have also changed: stone, clay tablets, wax tablets, papyrus, parchment, paper, and then diskettes, CDs, and flash drives, all the way to cloud storage, which surpasses the largest classical libraries in terms of the volume and speed of stored information.

In the 21st century, another invention gave another impetus to this development — the network interaction of computers and remote transmission of information from one machine to another, which was called the Internet. The properties of the modern digital format of information presentation — the possibility of copying without loss of accuracy, increasing the recording density, transmission speed, and, as a result, the scale of replication — is another milestone in the course of those technological trends that have contributed to the evolution of translation activity throughout its history. The benefits of using the new opportunities associated with ICT in translation are that they save resources, such as time. Editing a text, making changes to it, copying takes less time today than it did 30-40 years ago. Another example is the absence of the need to use bulky material carriers. If earlier you needed paper, stationery, a large number of dictionaries and reference books, special literature, and much of this could be obtained only in libraries and even then not always, today translation requires a personal computer, software and an Internet connection, which have limitations in terms of resources

since the entire toolkit is virtual. Add to this the adaptability and flexibility of programs. The costs of searching for information are reduced. The translator can change the workspace, characteristics and properties of translation tools (translation memory programs, automatic translation programs, databases and corpora) optimally for him, creating conditions for the most comfortable and efficient work.

Artificial intelligence in translation

Technological progress has changed and continues to change the face of the profession. It affects the translation process and its qualitative and quantitative characteristics. Active developments in the field of artificial intelligence (AI), designed to become the next round of scientific and technical progress, cause certain fears: does it not harbour a threat to the art of translation, as a kind of human creative activity and the source of its existence, does it not mark the beginning of the art of translation the end

If we are guided not so much by the desire to follow intellectual fashion, but by the need to predict possible answers to the challenges of the modern era, to reveal the essence of changes in translation practice and in the training of translation personnel, which are happening today before our eyes, and those predicted for the next 10-20 years, then the issue of the correlation of the art of translation of activity and artificial intelligence in the global information and communication system turns out to be far from empty.

In this regard, three groups of questions relating to the following aspects can be considered first of all:

1) cognitive-technological: about the possible correlations of traditional cognitive operations, which constitute the art of translation, and digital information and communication technologies of AI in the modern world;

2) socio-economic: about possible social changes that can affect the translator profession in the next 20 years;

3) pedagogical and psychological: about the peculiarities of training translation personnel for uninterrupted communication, which ensures the functioning of the "digital society" of the future, and about the

development of constructive behavioural and activity reactions in response to predicted changes in the translation profession.

The concept of "neural machine translation" (NMT)

Neural machine translation is a new type of translation that is a system of network interaction of the cognitive-communicative activity of a human translator and digital information and communication tools.

The idea of interaction between human translators and AI (machine) is not new. At the beginning of the 90s of the last century, due to the introduction of computerization in many types of human activity, the issues of automatic translation were once again at the centre of the attention of translation researchers. It was also necessary to study the nature of human-machine interaction in translation activity. And the simplest and most logical way seemed to be the distribution of functions between a human translator and a machine by the goals of communication and requests from society. At a scientific conference in Montreal in 1993, dedicated to determining the place of automatic and "human" translation in public translation practice, one of the reports admitted that in terms of translation methodology, it is very tempting to talk about competition and even antagonism between human and machine translation, that these two processes are irreconcilable and lead to completely different results. However, in the market of translation services, these two types of translation can complement each other under different requests and requirements for quality, volume and terms of product submission and financial capabilities of the consumer-customer, i.e. coexist with each other (Derieux, 1994).

NMT appeared in 2016. To date, this is the most successful translation software. In addition to being able to reduce error by 60% compared to its predecessor, statistical machine translation (SMT), NMT is also significantly faster.

NMT is based on a model of neurons created in the likeness of the human brain. This set allows the software to create contextual links between words and phrases. She can make these connections by learning language

rules. It scans millions of blocks from your database, identifying common features. The machine then uses the learned rules to create statistical models that help it understand how a sentence should be constructed.

An innovative feature of the creation of NMT is a new language of numbers, which helps with translation. The machine encodes each word into a number, into the so-called vectors: 1, 2, 3, 4, 5, 6. This number series is transmitted to the neural network and further decoding takes place. Based on the learned language rules, the system outputs the corresponding words in the translation language. The numbers 7, 8, 9, 10, and 11 corresponding to the words of the entire sentence are generated. Then these numbers are deciphered and as a result, are turned into sentences.

Essentially, the system translates words into its language and then "thinks" about how, based on what it already knows, it can shape those words into an understandable solution — just like the human brain did.

NMT can successfully translate different types of literature because it slowly but surely understands the context. The system focuses not only on the translated word but also on the words before and after it.

Key events in the development of neural machine translation:

2010. How Google Translate Works

Google Translate online translator already knows how to translate not only individual words but also entire sentences and texts. And if you look at these translations, you will see that the translated words do not always go in the same order as the original ones: the translator tries to generate sentences taking into account the meaning and rules of the language. For translation, a person needs a wide variety of knowledge about the world and the language. But Google Translate uses a different hack: it analyzes millions of texts and human translations and generates patterns from frequently occurring phrases. The more translations he processes, the better its translation becomes.

2016. Google Translate starts using meaning to translate

Until then, Google Translate has used a statistical method of translation. It broke the sentence into phrases, and analyzing millions of previously made translations, determined the most likely translation of a given phrase. This works much better than literal translation but is still significantly worse than human translation. The new version of the service, based on Neural Machine Translation technology, translates not words or phrases, but entire sentences. The system extracts objects, events and connections between them from the sentence, and then expresses the meaning in another language. It consists of two 8-layer neural networks, analyzing and synthesizing. An additional attention module is installed between the neural networks, which controls that rare words that are important for the meaning of the sentence are not missed. At the moment, the new algorithm works with 9 languages: English, French, German, Spanish, Portuguese, Chinese, Japanese, Korean and Turkish. Support for all 109 languages will be added in the future.

2016. Facebook abandoned Bing Translator in favour of its translator

Facebook has been providing the ability to translate posts into your language for several years now. Until now, this function was carried out using Microsoft's Bing Translator, but Facebook decided to abandon it and developed its own. It is said that Bing is suitable for official texts, but does not cope well with ordinary human hacks filled with errors and phraseological units. To train the translator, Facebook uses its huge database of user messages, i.e. everything you write on Facebook can be used as a translation of other posts.

2017. Google introduced wireless headphones with a built-in translator

In a big reveal, along with a new phone, laptop and other goodies, Google introduced the \$159 Pixel Buds wireless earbuds, which are designed to get you closer to your Google Assistant. At first glance, this is just a pathetic parody of Apple AirPods + Siri. However, Google has a big advantage - a translator that translates speech in real-time. And with the new headphones, you will be able to negotiate with foreign partners like a President. The speech recorded by the built-in microphone in

a foreign language (and 40 languages are supported) will be played back in your language in the headphones. And your partner will hear a simultaneous translation of your speech in his headphones.

2019. PROMT released a corporate translation server based on neural networks

PROMT has introduced a translation solution using neural networks and big data technologies - PROMT Neural Translation Server. Modern machine translation systems mainly use a statistical or neural method. PROMT Neural - uses a hybrid approach, where both the statistical model and the neural network offer their translation option. Algorithms developed by the company analyze the text and decide which technology is best suited for translating a particular piece of text. At the same time, according to the developers, the system takes into account the full context of the sentence in the source text and the previously created translation. This approach, according to PROMT, provides a translation without a "machine accent", the closest to a "human" one. The cost of the solution may vary depending on the client's requirements for customization and the number of users.

2019. Google introduced Translatotron - a technology for the simultaneous translation of the oral speech

Google has introduced a new technology for simultaneous translation of oral speech - Translatotron. Typically, systems use a waterfall model to translate spoken language from one language to another. First, the system automatically recognizes speech for its transcription, then the received text is machine translated, and then the text is converted into an audio recording. Such a system is also used in Google Translate. Google's new experimental algorithm skips the speech-to-text step. The neural network created by the developers receives a spectrogram of the original audio recording with a voice and synthesizes a spectrogram with a speech in another language. The algorithm then synthesizes the audio file.

2019. Google Assistant learned simultaneous translation for 27 languages, including Ukrainian

The Google Assistant virtual assistant can now help you communicate more easily

with foreign partners and clients. It has a simultaneous translation mode into 27 languages. The first device to support it was the Google Home Hub smart display. To activate the function, you need to ask the Assistant to be a translator in the selected language. While the translator does not work perfectly, therefore, in addition to simultaneous translation, you will also get funny meanings that will create a more relaxed atmosphere for communicating with foreign partners and clients.

2020. iOS 14 introduces offline translator, browser selection, camera indicator

Apple introduced a new version of iOS 14 mobile OS. The new "App Library" automatically organizes applications into categories - like folders, only better. It will also be possible to hide entire screens with applications on the main page. Apple Translate has more language pairs for translation and a simultaneous translation capability that uses machine learning-assisted speech recognition. The application can work completely offline. Also, there is a choice of browser and mail service by default. Before this, links only opened in Safari by default. Now you can assign various commands by tapping on the back cover of the phone. An indicator of a working camera or microphone has appeared. If some application is using your camera right now, you will see a green dot in the upper right corner. If using a microphone, yellow.

2022. Facebook releases AI technology for translating texts into 200 languages

Mark Zuckerberg said that his company has opened the source code of an AI model that can translate text into 200 languages. According to him, the multilingual model has more than 50 billion parameters, it was trained using the Research SuperCluster supercomputer. Advances in this area will enable more than 25 billion transfers per day across the company's apps, Zuckerberg wrote. This is part of the No Language Left Behind (NLLB) project that the company announced in early 2022. In particular, the NLLB-200 model can perform "high-quality" translations in 55 African languages.

2023. Online translator DeepL introduced the Write AI assistant to correct errors in the text

The German company DeepL has released a beta version of DeepL Write, an AI assistant for writing texts in a foreign language. Like the similar service Grammarly, this tool corrects grammatical errors and suggests options to improve style or find more accurate words. The team decided to launch the tool after noticing that users often translate text from their language into a foreign language and vice versa to catch possible errors. The next step in the development of the tool will be to focus not on the content of the text, but on "elusive tones and wording".

Like the brain, deciphering different information, this artificial neural network looks at the received information and generates the next word based on the previous one. In this way, it will learn which words to focus on and, relying on existing examples, determine which context is of primary importance. This method is a type of multi-level learning and can improve as the system receives more and more data. In NMT, the context of decryption is called "alignment", it occurs with the help of the Attention mechanism, which takes an intermediate place in the system between encryption and decryption.

In this methodological system, both outright antagonism and mutual benefit are indeed combined. The antagonism between machine and man is caused, on the one hand, by the ever-increasing concern about the future of the human profession of the translator, who will try to replace artificial intelligence in all situations of interlanguage communication, which is more economically advantageous, and on the other hand, by criticism of automatic translation programs that offer options, are not able to compete in various situations of interlanguage communication with the options of a human translator.

The mutual benefit of the human-AI relationship in this system is obvious. On the one hand, a smart machine that instantly operates with large data allows the translator to quickly review a possible large number of options for a "specific case" that caused difficulties, and make a choice based on individual logic. On the other hand, each new

version of the "specific case" translation proposed by the translator and entered into the cloud of big data in the global information system enriches the system and allows the self-learning machine to predict it in the future for new translation decisions.

Thus, thinking about "digital translation" and the binomial human translator/AI as a system of human interaction that takes advantage of information technology in translation and AI that performs so-called automatic translation should not be limited solely to the ability of AI to perform with that or to some other extent the functions of a human translator, completely or partially replacing him in some situations of interlanguage communication. It is also important that the AI systematizes the previous decisions of the human translator by constantly learning itself.

Cognitive aspect

It would be naive to assume that the interaction between humans and artificial intelligence affects only the technological processes of translation, as well as the fact that only AI is subject to development and evolution. Human cognitive abilities, constantly interacting with AI, also remain unchanged. Cognitive operations carried out by a person in the process of translation directly depend on the degree of development of such abilities as perception and attention, speed of information processing, memory, simultaneous operation of language systems, and language activity.

By delegating some functions of working with information to artificial intelligence, a person frees his mind from some cognitive operations, which in the process of evolution can lead either to the weakening of human intelligence, up to complete degradation, or, on the contrary, to the filling of the vacated intellectual space with new, until known cognitive abilities.

It is hardly possible to predict all possible changes in the translator's cognitive activity. Therefore, let's focus on only two, but extremely important for the art of translation, phases of the translation process - perception and understanding of the original message.

Socio-economic aspect

In the socio-economic sphere, it is still too early to make predictions about the translator. Of course, compared to human translation, automatic translation is more profitable for translation consumers: volumes increase, and translation speed increases with minimal costs. Therefore, the question of whether AI can displace humans from this activity is not entirely accurate. Rather, the question should be asked whether human society will want to entrust the performance of this social function to AI, and if so, in which areas of communication, in which language combinations, in which types of translation, in which communicative situations.

Today, there is a lot of talk about the fact that the introduction of new technologies and the achievement of the level of digitalization that is already possible today will inevitably result in the release of huge masses of workers, and the disappearance of entire classes of professions. Mass professions, both workers and intellectuals (drivers, salesmen, accountants, economists, lawyers, porters, etc.) will be under threat. At the same time, the shortage of highly qualified personnel capable of working in new economic conditions will worsen. The development of digital technologies is designed primarily to optimize the work of translators and to fall into pessimism about the future of the profession and its demand is at least unconstructive. A study conducted by Frey and Osborne from the University of Oxford 6 years ago ranked the professions of translators and interpreters only 265 out of 702 professions susceptible to full or partial automation with a probability ratio of 0.38 (Frey, Osborne, 2).

Indeed, "technological unemployment", associated with the complete replacement of man by machine, threatens translators only to a weak extent. Of course, complex algorithms and developments in the field of robotics and artificial intelligence based on big data make it possible to automate many non-standard tasks today. But activities involving complex perception and awareness tasks, creative intelligence tasks, and social intelligence tasks are difficult to automate.

The art of translation, whether it is an oral or a written form, includes the tasks

inherent in creative intelligence and, of course, the tasks of social intelligence. The main obstacle to automating the art of translation is the difficulty or impossibility of classifying creative values in such a way that they can be coded in a program (Boden, 2003). In addition, human values change over time and differ from culture to culture. If art and creativity by definition involve not only innovation but also value, and since values vary widely, it follows that many of the arguments, counterarguments, and controversies about creativity stem from disagreements about value itself. Even if we could discover, categorize and encode our creative values so that a computer could then operate and control these algorithms on its own, the differences would remain the same. They would relate to how creatively the computer approached the solution of the problem, and how skillful it was. The task becomes even more difficult when it comes to translation evaluation.

However, although some algorithms and robots can reproduce certain aspects of human interaction in society, recognizing natural human emotions in real-time is still very difficult for artificial intelligence, and responding to them adequately is more difficult.

Thus, it can be assumed that under the influence of new digital technologies, the profession of translator will not disappear, but will change. The axiological aspect is important in connection with the prospects of the digital revolution and its impact on social life. Thus, according to scientists, the consequence of the globalization model approved in the 90s was not only the financial and economic and power pressure of some countries on others.

Pedagogical aspect

To prepare translators to ensure successful interlingual communication in the conditions of digitization of most types of human activity, it is necessary to carefully and comprehensively consider the issue of changes in the content of the education of translators, which provide not only an effective dialogue between human intelligence (translator) and AI (automatic translation programs) within the framework of the translation binomial and features of electronic media.

The considered example of reading in a digital environment makes us take a closer look at the main tasks of translation didactics for the formation of translation personnel of the future, which needs to resolve the main contradiction between the cognitive abilities formed spontaneously by the digital environment during the mastering of the main program of secondary general and higher special education. Translation is necessary, under conditions when the former opposes the development of the latter.

Accordingly, it is necessary to clarify and supplement the content of the education of a translator in the digital era, which involves, first of all, the introduction of new disciplines aimed at both the development of new competencies and the improvement of previously acquired ones in the secondary general education system, in particular: professional “translation reading”, “home” text processing, post-machine editing of texts, search, processing and verification of information in the “big data” system, etc.

Currently, the so-called post-editing, i.e., editing texts translated by machine translation programs. To clarify the content of translator training, it is also necessary to determine the areas of interlanguage communication that are most prone to automation soon. This involves a careful study of the feasibility of including in the training program the development of branch translation skills (legal, medical, technical, etc.), based on mastering complexes of special terminology, to establish the most effective balance between memorizing and searching for linguistic information.

Conclusion

In the conditions of a competitive dialogue between natural and artificial intelligence in translation activities in the digital era, more attention should be paid to the formation of the translator's personality as a specialist in interlingual and intercultural communication, capable of rationally making the most effective decisions based on a systemic transdisciplinary view of translation activities. At the beginning of the 20th century,

there was a popular saying: "Generals always prepare for the last war." If we continue to train translators today according to the models and ideas about translation activity that were developed decades ago and have not yet lost their relevance, then we can resemble such generals, and the new generation of translators that is being formed today may not be ready for future changes in society. As for the threats posed by artificial intelligence to the art of translation, let's remember that art and technology have always intersected and fed each other — the experiments of Leonardo da Vinci and Michelangelo are a vivid confirmation of that. How and what will be demanded and appreciated by society is another question.

References

1. Boden M. A. *The creative mind: Myths and mechanisms*. Routledge, 2003.
2. D'Alembert J. le R. *Observations sur l'art de traduire* (1763). *Oeuvres de d'Alembert. Tome 4, Partie 1*. Paris, Ed. A. Belin, Bossange père et fils, Bos-sange frères, 1822, pp. 29-42.
3. Durieux C. *Traductique et traduction humaine : concurrence ou complémentarité?* TATAO: RECHERCHES DE POINTE ET APPLICATIONS IMMÉDIATES. Actualité scientifique. Actes du Colloque de Montréal 1993. Sous la direction de: André Clas, Université de Montréal, Pierrettes Bouillon, ISSCO de Génève, 1994.
4. Frey C. B., Osborne M. A. *The future of employment: how susceptible are jobs to computerisation?* Available at: http://www.oxford-martin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf.
5. Mounin G. *Les problèmes théoriques de la traduction*. Paris, Gallimard, 1963.
6. Koliasa O., Lelet I., Serebriakova V., Yukhymets S. *The Use of Hypermedia Technologies in Higher Education Institutions During COVID Lockdown* (May 23, 2021). *Arab World English Journal (AWEJ) Special Issue on COVID-19 Challenges April 2021*. Available at SSRN: <https://ssrn.com/abstract=3851662>.

The article has been sent to the editors 19.07.23.
After processing 04.08.23.
Submitted for printing 10.08.23.

Copyright under license CCBY-SA4.0.